Unit 9 Day 4

p334-6: 2-6(even) 12-40(even) 43,44

(2) The distance away from a storm varies directly with the number of seconds between seeing lightning and hearing thunder, with a constant of variation of $\frac{1}{5}$.

(4) The average distance that a gas atom travels between collisions varies inversly as the square of its radius and the number of atoms per unit volume with a constant of variation of $\frac{1}{4\pi}$.

(6) The centripetal force of an object varies directly as its mass and the square of its velocity and varies inversely as the radius of the circle that it mores along with a constant of variation of 1.

(12)
$m = Kzp$
$10 = K(3)(5)$
$10 = 15K$
$\frac{2}{3} = K$

$m = \frac{2}{3}zp$
$m = \frac{2}{3}(5)(7)$
$\boxed{m = \frac{70}{30}}$

(14)
$p = \frac{Kz^2}{r}$
$\frac{32}{5} = \frac{K(4)^2}{10}$
$\frac{32}{5} = \frac{16K}{10}$
$320 = 80K$
$4 = K$

$p = \frac{4z^2}{r}$
$p = \frac{4(2)^2}{16}$
$p = \frac{4(4)}{16}$
$\boxed{p = 1}$

(22)
$y = \frac{K}{x}$
$\frac{y}{3} = \frac{1}{3x}$
y is cut in third

(16)
$y = \frac{Kx}{m^2r^2}$
$\frac{5}{3} = \frac{K(1)}{(2)^2(3)^2}$
$\frac{5}{3} = \frac{K}{36}$
$\frac{180}{3} = K$
$60 = K$

$y = \frac{60x}{m^2r^2}$
$y = \frac{60(3)}{(1)^2(8)^2}$
$y = \frac{180}{64}$
$\boxed{y = \frac{45}{16}}$

(18)
decreases, increases $y = \frac{K}{x}$

(20)
$y = Kx$
$\frac{y}{2} = \frac{Kx}{2}$ halved

(24)
$m = Kp^2q^4$
$= K(2p)^2(3q)^4$
$= 4K \cdot 81 p^4q^4$
$= 324Kp^4q^4$
$324m = 324Kp^4q^4$
m is 324 times larger

(26) let w = amt of water emptied
let d = diameter of pipe
$w = Kd^2$
$200 = K(6)^2$
$200 = K(36)$
$K = \frac{200}{36} = \frac{50}{9}$
$\boxed{800 \text{ gallons}}$

$w = \frac{50}{9}d^2$
$w = \frac{50}{9}(12)^2$
$w = \frac{50}{9} \cdot \frac{16}{144}$
$w = 800$

(28) let r = resistance
let d = diameter of wire
$r = \frac{K}{d^2}$
$.4 = \frac{K}{(.01)^2}$
$.4 = \frac{K}{.0001}$
$K = .00004$

$r = \frac{.00004}{d^2}$
$r = \frac{.00004}{(.03)^2}$
$r = \frac{.00004}{.0009}$
$r = .0444 \text{ ohm}$

(30) let I = interest
let p = principal
let t = time
$I = Kpt$
$110 = K(1000)2$
$110 = 2000K$
$K = .055$

$I = .055pt$
$I = .055(5000)(5)$
$I = 1375$
$\$1375$

Unit 9 Day 4 Continued

(32) let f = force of wind on vert. surf.
let S = surface area
let V = velocity of wind

$f = KSV^2$
$50 = K(\frac{1}{2})(40)^2$
$50 = 800K$
$\frac{1}{16} = K$

$f = \frac{1}{16}SV^2$
$f = \frac{1}{16}(2)(80)^2$
$f = \frac{1}{8}(6400)$
$f = 800$

800 lbs of force

(34) let l = load let d = diameter
let h = height

$l = \frac{Kd^4}{h^2}$
$8 = \frac{K(1)^4}{9^2}$
$8 = \frac{K}{81}$
$648 = K$

$l = \frac{648d^4}{h^2}$
$l = \frac{648(\frac{2}{3})^4}{(12)^2}$
$l = \frac{648(\frac{4}{9})}{144}$
$l = \frac{288}{144}$
$l = 2$

2 metric tons

(36) let p = period of pendulum
let l = length of pendulum
let a = acceleration of pendulum

$p = \frac{K\sqrt{l}}{\sqrt{a}}$
$6\pi = \frac{K\sqrt{289}}{\sqrt{980}}$
$6\pi = \frac{17K}{14\sqrt{5}}$
$K = \frac{6\pi \cdot 14\sqrt{5}}{17}$
$K = \frac{84\pi\sqrt{5}}{17}$

$p = \frac{84\pi\sqrt{5l}}{17\sqrt{a}}$
$p = \frac{84\pi\sqrt{5 \cdot 121}}{17\sqrt{980}}$
$p = \frac{924\pi\sqrt{5}}{238\sqrt{5}}$
$p = \frac{66}{17}\pi$

Period is $\frac{66}{17}\pi$ seconds

(38) let n = # of LD calls
let p_1 = pop of city 1
let p_2 = pop of city 2
let d = dist. btw city 1 + city 2

$n = \frac{Kp_1p_2}{d}$
$10000 = \frac{K(50{,}000)(125{,}000)}{500}$
$5000000 = K(6250000000)$
$K = .0008$

$n = \frac{.0008p_1p_2}{d}$
$n = \frac{.0008(20{,}000)(80{,}000)}{800}$
$n = 1600$

1600 calls btw the 2 cities

(40) let R = radiation heat
let t = Kelvin temp

$R = Kt^4$
$213.73 = K(293)^4$
$K = \frac{213.73}{(293)^4}$
$K = 2.9 \times 10^{-8}$
$R = (2.9 \times 10^{-8})t^4$
$R = (2.9 \times 10^{-8})(335)^4$
365.237 radiation of heat

(43) $L = \frac{25F^2}{St}$
$500 = \frac{25F^2}{(200)(\frac{1}{250})}$
$500 = \frac{25F^2}{\frac{4}{5}}$
$400 = 25F^2$
$16 = F^2$
$\pm 4 = F$

F-stop is 4

(44) $L = \frac{25F^2}{St}$
$125 = \frac{25(2)^2}{(200)(t)}$
$125 = \frac{100}{200t}$
$125 = \frac{1}{2t}$
$t = \frac{1}{250}$

$\frac{1}{250}$ sec shutter speed should be used.